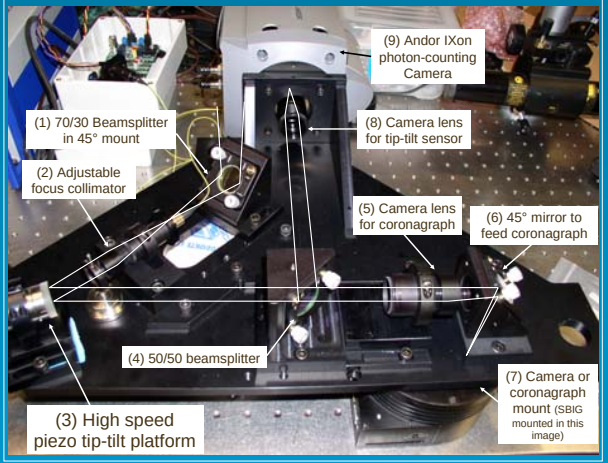
# BESSEL: A High Strehl Visible Telescopic Test Bed for Planet Finding Coronagraphs

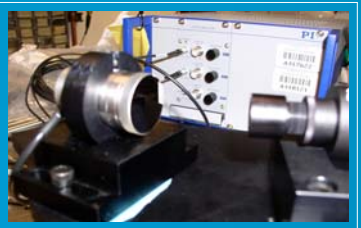
**Mary Anne Peters[1], Laird M. Close[1], Grover A. Swartzlander[2], Rukiah S. Abdul-Malik[2], Matt Rademacher[1]**
1.Steward Observatory, University of Arizona, 2. Optical Sciences, University of Arizona
mpeters2@email.arizona.edu

## Figure 1: BESSEL

Light comes down through the 8 inch refractive telescope and hits the beamspitter (1). After passing through focus (where the laser-diode is currently placed), the light is collimated (2) by a f/50 acromat. In the pupil plane the light hits the piezo (3), where wavefront tilt distortions are corrected. The light is then split by a second beamsplitter(4). Half the light goes through a f/100 camera lens (5) and is sent down (6) to the coronagraph, or camera (7). The remaining half of the light is sent through a f/50 camera lens (8) to the Andor iXon (9) guiding camera.




## Figure 2: The tip-tilt platform



This high speed piezo will correct for wavefront distortion in tip and tilt due to the atmosphere. Since it is stiff and light-weight we will be able to drive it at over 1 kHz using an Andor iXon camera, which will allow strehl ratios on the sky exceeding 96%.

## Abstract.

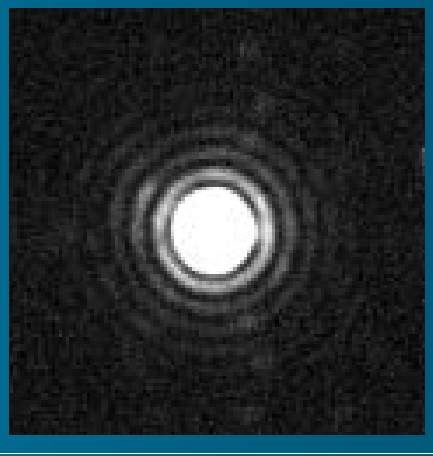
We have constructed a high-speed image stabilization system (BESSEL) which should obtain images with contrast ratios up to 10,000:1 at 3λ/D with a optical vortex coronagraph (OVC) inserted. It will be attached to the 8-inch Steward Observatory refractive telescope to test coronagraphs. The high-speed tip/tilt mirror platform is controlled by a photon-counting camera that allows us to correct the wave front distortion at a rate exceeding 1 KHz. The system is projected to achieve strehl ratios over 96% at 850 nm when the telescope aperture stopped down to less than the Fried parameter (approximately 50 mm). With this telescopic testbed, we plan to characterize a number of different coronagraphs, primarily a OVC.

## Figure 3: Steward Observatory Telescope

The telescope, est. 1922, is home to a 21-inch reflective mirror is on an equatorial mount (left image) and the 8-inch refractive finder (bottom right image). For this project, we are using just the finder telescope.

## Figure 4: Image from BESSEL

This is a thirty second exposure taken with BESSEL in the lab with a camera attached (as in Figure 1) using a HeNe laser-diode. The strehl in this image is greater than 98%. The OVC occulting mask is not yet inserted.



## Where we are headed:

Over the next couple months, we will be using the Steward Observatory finder telescope to test BESSEL and the OVC (constructed by Grover Swartzlander and Rukiah Abdul-Malik). Our preliminary targets will be Sirius A and B and Procyon A and B.

*We welcome other coronagraphic architectures for realistic telescopic characterizations on BESSEL in addition to the OVC.*